Game Changing Development

Station Explorer for X-Ray Timing and Navigation Technology (SEXTANT)

Completed Technology Project (2011 - 2019)

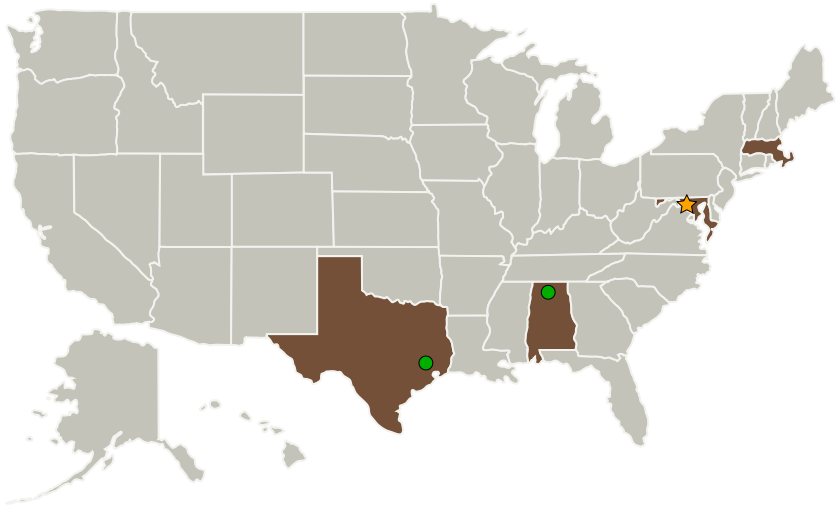
Project Introduction

Enable GPS-like autonomous navigation in Solar System, and beyond, using millisecond period X-ray emitting neutron stars (Millisecond Pulsars) as beacons. Explore utility of pulsar-based time scale, and potential to maintain clock synchronization over long distances

Anticipated Benefits

Autonomous navgation available anywhere in the Solar System and beyond, reduce load on space networks.

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
●Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas
●Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

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Co-Funding Partners	Type	Location
Exploration Capabilities	NASA Program	

Primary U.S. Work Locations	
Alabama	Maryland
Massachusetts	Texas

Project Transitions

June 2011: Project Start

January 2019: Closed out

Closeout Summary: The Station Explorer for X-ray Timing and Navigation Technology (SEXTANT) project advanced a technology enhancement to the Neutron Star Interior Composition Explorer (NICER) mission. The SEXTANT capability used the locational arrangement and unique frequency signatures of neutron stars to generate near-earth global positioning information. SEXTANT conducted two major demonstration experiments: Navigation Experiment 1 (NE-1) and Navigation Experiment 2 (NE2). NE1 demonstrated the feasibility of performing autonomous navigation on-orbit without the need for near-earth assets. NE2 demonstrated self-reliance of SEXTANT to continue navigation in the absence of ground communication. The navigation experiments NE1 and NE2 started with an intentionally degraded orbit position and velocity and then maintained orbit knowledge by processing only X-ray emitting observations. The SEXTANT capability will provide an autonomous galactic positioning capability and is being considered for use on Gateway and CubeSat missions.

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Game Changing Development

Project Management

Program Director:

Mary J Werkheiser

Program Manager:

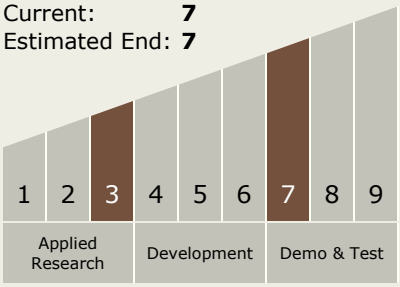
Gary F Meyering

Principal Investigator:

Jason W Mitchell

Technology Maturity (TRL)

Start: **3**
Current: **7**
Estimated End: **7**



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Images

NICER/SEXTANT Logo
Station Explorer for X-Ray Timing and Navigation Technology
(https://techport.nasa.gov/image/143235)

Stories

Interplanetary GPS Comes a Step Closer
(https://techport.nasa.gov/file/164961)

Links

NASA SEXTANT
(https://www.youtube.com/watch?v=wo-6ocenLv4)

NASA | SEXTANT: Navigating by Cosmic Beacon
(http://youtu.be/7ixwZQPyaWE)

Project Website:

https://www.nasa.gov/directorates/spacetech/home/index.html

Target Destinations

Earth, The Moon, Mars